Continuing Medical Education

The Acute Abdomen

Structured Diagnosis and Treatment

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Summary

Background: The acute abdomen is a life-threatening clinical entity that requires immediate diagnostic evaluation and appropriate treatment. 15–20% of emergency room patients with acute abdominal pain need interventional or surgical treatment.

Methods: This narrative review is based on publications retrieved by a PubMed search, current textbooks and guidelines, and the authors' personal experience.

Results: The acute abdomen presents with the sudden onset of maximally intense abdominal pain, sometimes with guarding, and often with impaired general well-being, ranging to manifestations of shock. Its more common causes, aside from nonspecific abdominal pain (30–41%), are acute appendicitis (8–30%), cholecystitis (9–11%), and ileus (4–5%). The diagnosis is established by the history and physical examination, laboratory tests, imaging studies, and, in some cases, exploratory laparoscopy. The acute abdomen is generally a surgical condition, but it often requires interdisciplinary, multimodal treatment and follow-up. It carries a 2% to 12% mortality, with the figure rising for every elapsed hour until specific treatment is provided.

Conclusion: Structured, quality-controlled, rapid, and targeted diagnosis and treatment markedly lower the morbidity and mortality of patients presenting with an acute abdomen.

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The acute abdomen is a life-threatening emergency. 5–12% of all patients presenting to emergency departments complain of acute abdominal pain (1, e1, e2). Among this large number of patients, it is essential to identify those who have an acute abdomen. 15–20% of patients presenting with acute abdominal pain need an intervention or operation (2, e1). The mortality of emergency abdominal surgery is still high, at 2–12% (3, 4), and the clinical situation of the acute abdomen requires immediate diagnostic evaluation and appropriate treatment. Prompt treatment can save the patient's life and minimize subsequent complications. In this article, we describe the diagnostic and therapeutic measures to be taken from the moment of presentation up to surgical treatment, if necessary. Two *eCase Illustrations* are provided for the particular situations of acute mesenteric ischemia and perforated sigmoid diverticulitis.

Information on CME

This article has been certified by the North Rhine Academy for Continuing Medical Education. **The questions may be found at the end of this article.** The closing date for entries is 6 March 2026. **Participation is possible at: cme.aerzteblatt.de**

Learning objectives

The purpose of this article is to improve the care of patients with an acute abdomen by presenting the relevant diagnostic considerations and a structured approach to treatment. The article focuses on:

- the elements of clinical, laboratory, and radiological diagnosis
- causes of the acute abdomen
- case illustrations

Definition

The term "acute abdomen" refers to severe abdominal pain of sudden onset, possibly accompanied by guarding (involuntary contraction of the abdominal wall muscles to reduce pain). The acute abdomen is a clinical syndrome and not a diagnosis in itself. Its varieties range from a subacute abdomen to a fulminant acute abdomen in the strict sense. Patients with an acute abdomen have markedly reduced general well-being and may be suffering from circulatory decompensation and manifestations of shock.

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Box 1

Abdominal guarding / peritoneal signs

Abdominal guarding reflects a state of peritoneal irritation. It can be triggered by any kind of vibration, such as that associated with walking or coughing, or else elicited on physical examination by palpation. Abdominal guarding can initially be local and limited to the area of the organ that is the site of the problem; it can also spread diffusely to the entire peritoneum. If there are any clinical or laboratory signs of inflammation, it can be concluded that peritonitis is present.

Acute abdominal pain: initial contact with the patient

There are special, systematic procedures to be followed in the initial examination of various body systems, including the abdomen.

History

The medical history of the patient with an acute abdomen is of crucial importance in the diagnostic evaluation; it is to be obtained directly from the patient and/or any accompanying persons. First, the precise features of the pain should be asked about: its onset, duration, site, intensity, and nature (e.g., sharp, dull, colicky). Pain can often be characterized as either visceral or somatic. Visceral pain tends to be dull, deep, diffuse, and often cramp-like. It varies in intensity and is hard to localize. It is usually due to stretching of the hollow viscera, spasms, or sudden tension on the organ capsules (e.g. biliary colic, ureteric colic, pain from tension of the liver capsule) (5). Somatic pain, on the other hand, has a sharp, burning quality and is mostly easily localizable. It is usually caused by inflammation, e.g., organ perforation, appendicitis, cholecystitis, peritonitis, etc., or injury to an abdominal organ (6). The patient must also be asked whether the pain has shifted, as it typically does in appendicitis, for example, and about any exacerbating or alleviating factors. Accompanying symptoms such as anorexia, nausea, vomiting, fever, diarrhea, or constipation should be noted, as should the medication history and past medical history. Even with the profusion of diagnostic tests now available, detailed history-taking remains the key to rapid diagnosis and initiation of appropriate treatment (7).

Physical examination

The patient should lie supine on the bed, stretcher, or examining table. The examination of the abdomen begins with visual inspection, which can already yield clues to pre-existing underlying conditions (e.g., cutaneous signs of liver disease) but mainly provides evidence of the patient's nutritional state, the degree of abdominal distention, and any scars from previous surgery. Auscultation with a stethoscope in all four abdominal quadrants is performed next to detect any evidence of disturbed abdominal motility. Percussion is then used to elicit pain as a peritoneal sign (variant: pain on vibration) *(Box 1)*.

Lastly, the abdomen is thoroughly palpated. The precise site of pain on palpation may give away the diagnosis. It should be noted here that the early administration of analgesics is essential for patients with an acute abdomen. They can be given before the diagnosis is established, as it is known that they do not impede clinical assessment (8) *(Table 1)* (9).

Many specific medical terms for the typical sites and types of abdominal pain have been introduced since the late 19th century. Some have found their way into common medical language and can still be used today. For example, McBurney's point (described in 1889) is 50% to 80% specific and up to 45% sensitive, while Murphy's sign (described in 1903) is 62% to 97% specific and 47% to 96% sensitive (e3). A correct diagnosis can be made on the basis of a properly conducted history and physical examination with a specificity of 41% and a sensitivity of 88%, thus reducing the need for further diagnostic testing and saving time (10). Acute appendicitis is a typical example. Further imaging procedures, such as computerized tomography (CT) of the abdomen, confirm the clinical diagnosis in more than 70% of cases (e4).

General state of health

There is no universally accepted definition for an impaired general state of health, but patients with an acute abdomen often display generalized weakness, exhaustion, fatigue, and impaired physical and mental performance. An impaired general state of health is often also the initial, non-specific sign of inflammation or incipient sepsis. Studies by Bingisser et al. have shown that critically ill patients who initially present with generalized weakness or exhaustion as their main non-specific symptom have a higher mortality (11, e5). Up to 66% of surgical patients with the clinical picture of sepsis have their septic focus in the abdomen (12, e6). Abdominal sepsis is associated with a mortality of up to 26%, rising as high as 43% if the treatment is delayed (13, 14, e7). The question whether sepsis is present should, therefore, be asked routinely and assessed with the aid of internationally established scores such as the SOFA score or the simplified qSOFA score (altered mental state [Glasgow Coma Scale < 15], respiratory rate ≥ 22/min, systolic blood pressure ≤ 100 mmHg) *(Box 2)* (12, 15).

Causes of the acute abdomen

The incidence of the acute abdomen is around 5–7/1000 persons per year (16). 5–12% of all patients presenting to the emergency department have acute abdominal pain, and up to one-third of these patients need emergency treatment (16, e1, e2). In this article, we do not provide any separate discussion of pediatric and geriatric cases, but rather focus on the more common causes in adult medicine. Aside from nonspecific abdominal pain, these include acute inflammatory conditions such as appendicitis, cholecystitis, pancreatitis, and diverticulitis, as well as disturbances of gastrointestinal motility and perforated gastroduodenal ulcers. Further causes include gynecological and urological diseases, abdominal trauma,

and tumors in the abdominal cavity. Causes of the acute abdomen and of acute abdominal pain are listed in *Table 2*.

Other important differential diagnoses

Aside from acute processes in the abdomen itself, thoracic diseases can also present with the typical symptoms an acute abdomen and should also be considered in the differential diagnosis. These include aortic dissection, pulmonary embolism, myocardial infarction, pneumonia with possible concomitant pleuritis. The history (productive or unproductive cough, dyspnea, cardiovascular risk factors, pain radiation and character), electrocardiographic and laboratory findings, and thoracic imaging are essential rapid diagnosis. Rarely, an acute abdomen may be due to a purely medical illness, such as diabetic ketoacidosis or an Addisonian crisis (18).

Diagnostic evaluation

Laboratory testing

Laboratory testing should be carried out in parallel with the physical examination.

Blood gas analysis

Venous blood gas analysis (VBGA) should always be performed on initial contact in the emergency room. It is an important element of the evaluation of patients with acute abdominal pain. The electrolytes, acid-base status with anion gap, and blood glucose level may yield clues to the cause of the condition as well as an index of its severity. The hemoglobin and serum lactate levels are helpful in the investigation of possible bleeding or ischemia (6).

Emergency laboratory testing

A complete laboratory profile should always be obtained, with special attention to inflammatory parameters including C-reactive protein (CRP), interleukin-6 (IL-6), and procalcitonin (PCT). The use of serum markers for prognostication is controversial; these should only be measured as a supplement to the usual tests (19, 20, e13). For example, elevated PCT values have been shown to be 75% sensitive and 100% specific for the need for surgical treatment of an acute abdomen (e14, e15), yet Chi et al. and Salem et al. showed that serum CRP as a sole marker for the severity of an acute abdomen is of little added diagnostic value, with a specificity of 23%–64% (20, 21). It has also been shown that the use of serum lactate and IL-6, or of IL-6 alone, is correlated with the outcome of patients with an acute abdomen ($r^2 = 0.368$, $P = 0.008$) (e13, e16). The specificity for severe abdominal sepsis was 83% or 81%, and the sensitivity was 100% or 87% (serum lactate and IL-6; IL-6 alone). There is currently no standard recommendation about which inflammatory parameters should be measured.

Comprehensive laboratory testing should also include organ-specific tests, such as amylase and lipase for the pancreas. The current consensus holds that lipase is superior to amylase for this purpose and should, therefore, be measured alone (22, 23, e17). Further necessary tests include the transaminases (glutamic oxaloacetic transaminase [GOT] and glutamic pyruvic transaminase [GPT]), the cholestasis parameters (bilirubin, gamma-glutamyltransferase [γ-GT] and alkaline phosphatase [AP]), as well as the renal retention parameters (creatinine and urea) (e18, e19). The coagulation parameters should also be measured: in Europe, these generally include the Quick test, the International Normalized Ratio (INR), and the partial thromboplastin time (pTT). Abnormalities of coagulation tests are correlated with the severity and outcome of the acute abdomen (13, e6, e20). Laboratory values aid in the diagnosis of the cause of the acute abdomen and inform about possible dysfunction of other organ systems (e21). A blood type and screen should be obtained for all patients with an acute abdomen because of the potential need for a blood transfusion.

Aside from blood testing, urinalysis and urine culture should be routinely performed in women of childbearing age, along with a pregnancy test. Depending on the clinical presentation, additional specific tests may be indicated, e.g., troponin if myocardial ischemia is suspected.

Table 1

Typical sites of abdominal pain (9)

Upper abdomen	
Right	**Left**
cholecystitis choledocholithiasis pancreatitis liver abscess duodenal/gastric ulcer pneumonia/pleurisy diaphragmatic hernia	pancreatitis duodenal/gastric ulcer pneumonia/pleurisy colonic diverticulitis ulcerative colitis Crohn's disease subphrenic abscess
Lower abdomen	
Right	**Left**
appendicitis terminal ileitis gastroenteritis Meckel's diverticulum invagination sigmoid diverticulitis (long sigmoid) cecal tumor/ischemia nephrolithiasis pyelonephritis incarcerated inguinal hernia	sigmoid diverticulitis colitis adnexitis (bilateral) ovarian cyst (bilateral) incarcerated inguinal hernia tumor perforation (rectum, sigmoid colon) ectopic pregnancy
Variable localization	
angina pectoris acute mesenteric ischemia esophageal rupture (Boerhaave syndrome)) aortic aneurysm ileus	

Imaging studies

The history, physical examination (including vital signs), and laboratory testing often do not suffice to narrow down the differential diagnosis of the acute abdomen. Advanced imaging studies can yield further clues to the underlying cause *(Box 3)* (e22).

Abdominal ultrasonography

Abdominal ultrasonography is the imaging study of first choice for the acute abdomen. It is widely available and rapidly performed, it can be used directly at the patient's bedside, and it involves no radiation

Box 2

"Red flags" – combined warning signs*

- abdominal pain of sudden onset, progressing to maximal intensity
- inflammation (high fever, leukocytosis)
- circulatory instability, manifestations of shock
- neurological deficit
- patients at high risk (elderly patients, prior surgery, pregnancy, immune suppression, atypical clinical findings)

* Once the patient has been examined and the situation of an acute abdomen has been recognized, it is crucial to determine the specific diagnosis of the patient's problem. The physician must know the differential diagnosis of the acute abdomen and how the correct diagnosis is to be established.

Table 2

Common causes of acute abdominal pain in the emergency department (2, 3, 17, e1, e2, e8–e12)

Disease	Percentage of patients with acute abdominal pain	Incidence per 100 000 person-years
Nonspecific acute abdominal pain	30–41%	N.A.
Acute appendicitis	8–30%	100/100 000
Acute cholecystitis	9–11%	60/100 000
Ileus	4–5%	50–100/100 000
Gynecological focus	1–4%	N.A.
Acute pancreatitis	2–4%	13–43/100 000
Urological focus	2–4%	N.A.
Peptic ulcer (possibly perforated)	1–3%	7–15/100 000
Oncological cause	1–2%	N.A.
Diverticulitis (possibly perforated)	1–2%	150–160/100 000
Abdominal ischemia	0–1%	6–8/100 000

exposure. An initial assessment can be obtained with FAST ultrasound, a point-of-care test that immediately yields evidence of life-threatening pathologies, such as hemorrhagic injuries of the solid upper abdominal organs (liver, spleen), by detecting intra-abdominal free fluid. In hemodynamically unstable patients in particular, FAST ultrasonography can shorten the time to correct diagnosis and causally directed treatment (24).

In 53–83% of cases, detailed abdominal ultrasonography combined with the history and physical examination can yield the correct diagnosis. Classic causes of the acute abdomen, including cholecystitis, appendicitis, and sigmoid diverticulitis, can be reliably diagnosed by ultrasonography in up to 70% of cases, obviating the need for further imaging studies with radiation exposure (25). Ultrasound involves no radiation exposure whatsoever and is thus the first-line imaging study for pregnant women in particular (7). Nonetheless, despite its ready availability and wide applicability, ultrasonography is markedly less useful for diagnosis in the settings of obesity, meteorism, free intraperitoneal air, or impaired cooperation by a restless patient. The quality of abdominal ultrasonography is examiner-dependent, and comparisons with prior studies are often difficult (e22).

Conventional x-rays (plain films)

Depending on the clinical situation, an abdominal plain film in the standing or left lateral decubitus position can be performed for rapid further clarification if ileus or hollow-viscus perforation is suspected. Plain films have low sensitivity (47–56%) for discrete perforations with only a small amount of free air (2–5 mL) (e22); nor do they yield any clue to the site of the perforation, and so, in most cases, they add no clinically relevant diagnostic value (25). Nevertheless, plain films still have a role to play in routine clinical practice.

Computerized tomography

Contrast-enhanced abdominal CT has the highest sensitivity and specificity of all imaging studies performed for the acute abdomen in the emergency department (9, 24–26, e22). Especially for unstable, critically ill patients, the immediate establishment of the diagnosis and provision of specific treatment are essential (shock room protocol) (e22). Even diseases that are detectable by ultrasonography can usually be assessed better and more precisely by CT. For example, in acute appendicitis, the sensitivity and specificity of CT are superior to those of ultrasonography (91% and 90% vs. 78% and 83%), although CT adds diagnostic value only when the clinical picture is unclear or atypical, or when the appendix is retrocecal (27). Computerized tomography also provides valuable additional information in the situation of covered perforated sigmoid diverticulitis with abscess, CDD ("Classification of Diverticular Disease") 2a/b, and can also serve as a navigational aid for initial treatment, e.g., CT-guided abscess drainage (e22). Intravenous contrast medium should generally be given, as native CT is about 30% less accurate (7, 25) than contrast-enhanced CT. Contrast medium is indispensable in some situations, e.g., the search for a site of active bleeding or vascular occlusion, and it enhances diagnostic sensitivity in others, e.g., the search for an infectious focus or a mass

lesion. On the other hand, urinary calculi can be detected without contrast medium (e23). The risk factors for adverse effects of contrast agents include specific allergy (0.01–3% of patients), hyperthyroidism (0.25–4.9%), and renal failure (<5%); though uncommon, these risk factors still need to be considered before any CT scan (28, e24–e27). The decision whether to administer contrast medium should be based on the suspected diagnosis, the past medical history, and the clinical urgency of the evaluation. Orally or rectally administered contrast agents are not usually needed; they add value only in special situations, such as the visualization of intestinal peristalsis or a rectovesical fistula, and would otherwise delay diagnosis and treatment in acute situations (29).

Magnetic resonance imaging

Despite the advantage of not exposing the patient to ionizing radiation, magnetic resonance imaging (MRI) plays only a minor role in the diagnostic evaluation of the acute abdomen, as it is less commonly available than ultrasound and CT, and also takes longer to perform (25, e22). In a clinically stable, pregnant patient, MRI can be used instead of CT to limit fetal radiation exposure (e28). As stated in the current European Guidelines on Contrast Agents (ESUR), MRI in pregnant women should be performed without contrast medium in all but exceptional cases, because the safety of gadolinium-based contrast agents for the fetus has not been conclusively shown (28). The usual differential diagnoses of the acute abdomen in pregnant women can generally be adequately assessed or ruled out with native MRI or abdominal ultrasonography. Nursing mothers can be given both iodinated and (in women with normal renal function) macrocyclic gadolinium-containing contrast media, and breastfeeding can be continued afterward, as stated in the guidelines (28).

Box 3

Imaging studies for the diagnostic evaluation of the acute abdomen

- **"Focused assessment with sonography for trauma" (FAST)**
  Point-of-care ultrasound (POCUS) is a rapid and readily available imaging method for the identification of life-threatening causes of an acute abdomen. The use of FAST is not limited to abdominal trauma.
- **Abdominal plain films**
  These are less important than they once were because of their limited added diagnostic value. Nevertheless, they are readily available and rapidly obtained. Their use should only be considered after a careful risk-benefit assessment, depending on the patient's clinical presentation and the availability of tomographic imaging.
- **Contrast-enhanced abdominal CT**
  Of all emergency imaging studies for the acute abdomen, contrast-enhanced abdominal CT has the highest sensitivity and specificity. Especially in critically ill and unstable patients, immediate diagnosis and the subsequent rapid initiation of specific treatment are essential.
- **Abdominal magnetic resonance imaging**
  This plays a subordinate role in the diagnostic evaluation of the acute abdomen. It should only be used in clinically stable pregnant patients, and only if it is readily available. In these patients, the administration of contrast medium should be avoided if possible. Many differential diagnoses of the acute abdomen can be adequately assessed without contrast medium.

Diagnostic laparascopy

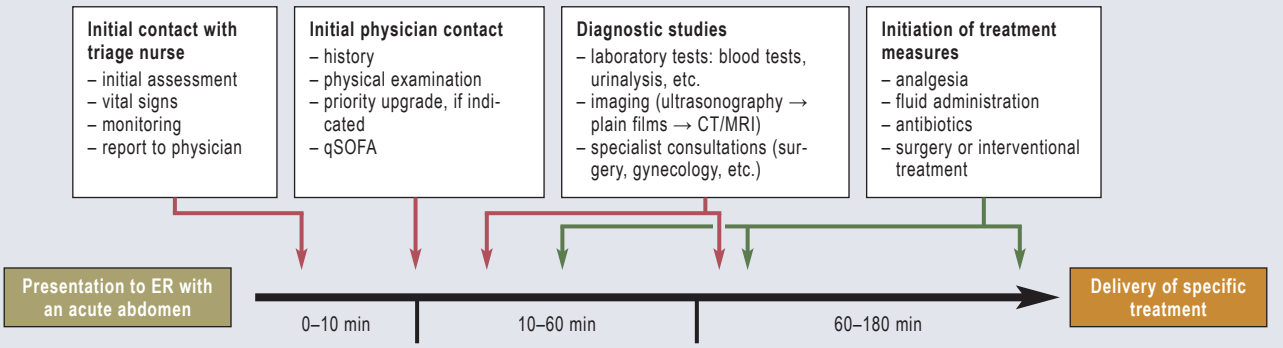
Diagnostic laparoscopy is an established and valuable tool in surgical emergency medicine. It is indicated when the history, physical examination, laboratory tests, and imaging studies point to an acute abdominal problem, but the diagnosis nevertheless remains unclear. Even with today's advanced ancillary diagnostic tests, a precise preoperative diagnosis cannot be made in about a quarter of cases. Laparoscopic diagnostic evaluation has a sensitivity, specificity, and accuracy of 75–100% (30, 31). In more than 75% of cases, the laparoscopic approach also enables immediate treatment (32). In emergency surgery, laparoscopy enables rapid decision-making and the immediate initiation of treatment. It is well known that the mortality of patients with an acute abdomen rises significantly with each elapsed hour until surgical treatment (33). Exploratory laparoscopy also lessens the number of unnecessary laparotomies, as conversion to open surgery is needed in only 7–10% of cases (34). Diagnostic laparoscopy is contraindicated in patients with diaphragmatic rupture and in those who are hemodynamically unstable. Other relative contraindications include, but are not limited to, manifest coagulation disturbances and severe pre-existing cardiopulmonary disease. In patients with a history of multiple prior abdominal operations, and in those with massive mechanical ileus and highly dilated intestinal loops, laparoscopy carries a risk of intestinal injury, and a primary laparotomy should be considered.

The need for prompt treatment of the acute abdomen

Chest pain units (CPU) and stroke units (SU) are now well-established key components of acute care, enabling the rapid diagnosis and treatment of patients with acute chest pain and acute neurological disturbances in accordance with the respective guidelines (e29). Their efficacy has been conclusively demonstrated.

Stroke patients are significantly more likely to survive (21% fewer deaths) and have significantly less disability at one year (13% less dependence on others) if they are treated in a stroke unit (35). Likewise, the CPUs that have been established in Germany since 2008 have significantly lessened the mortality, morbidity, and length of hospital stay of patients with chest pain (35, e29, e30). Analogous evidence suggests that the rapid treatment of patients with an acute abdomen may yield better outcomes. There are various internationally established tools for initial assessment in the emergency department (36, e31), whose use for all patients with an acute abdomen would be desirable. One such tool is the Emergency Severity Index (ESI): Patients with ESI 1 need immediate treatment; for those with ESI 2, initial therapeutic measures including continuous monitoring must be begun without delay, and evaluation by a physician must take place within 10 minutes. Patients with a suspected acute abdomen should always be assigned ESI 1 or 2 (37).

Diagram



The desired time course of patient care from the moment of initial contact to the delivery of specific treatment.
CT, computerized tomography; ER, emergency room; MRI, magnetic resonance imaging; qSOFA, quick sequential organ failure assessment (green arrows: start of therapeutic measures; red arrows: start of history-taking and diagnostic evaluation). The diagnostic evaluation overlaps with the treatment in a fluid process.

Despite the existence of these tools, there is evidence that diagnosis and treatment are still often delayed. For example, the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) in the UK revealed that 22% of the emergency surgical patients whose cases were studied did not receive timely surgical intervention. Delays occurred particularly in the decision to operate, access to diagnostic imaging, and the availability of an emergency operating room. Such delays are known to increase mortality and morbidity (e32, e33). Multiple studies have shown that the structured, rapid, quality-controlled care of patients with an acute abdomen can significantly lessen mortality (38, 39, e34).

The ideal time course from the moment of presentation of a patient with an acute abdomen is shown in the *Figure.* There should be no delay in treatment due to prolonged observation or unnecessary nonconclusive diagnostic tests. (7, 33, 40, e12, e32, e33).

Overview

The acute abdomen has many causes – surgical, medical, gynecological, and/or urological. It carries a mortality of 2–12%. The patient with an acute abdomen should always receive a high-priority initial assessment (ESI 1 or 2) and be seen by a physician within 10 minutes. A properly conducted history and physical examination can markedly lessen the need for further diagnostic testing. Contrast-enhanced abdominal CT is the standard method of emergency imaging of the acute abdomen, with the highest sensitivity (91%) and specificity (90%) of all imaging studies. Laparoscopy enables rapid decision-making and the immediate initiation of appropriate treatment. The mortality of patients with an acute abdomen increases with every hour of delay until appropriate surgical treatment. Structured, quality-controlled care and rapid consultation of a surgeon (within 60 minutes) can lessen the mortality and morbidity of patients with an acute abdomen.

Conflict of interest statement
The authors state that they have no conflict of interest.

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Supplementary material
Complete list of full references, eReferences, eCase illustrations: www.aerzteblatt-international.de/m2025.0019

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CLINICAL SNAPSHOT

Acute Corneal Hydrops

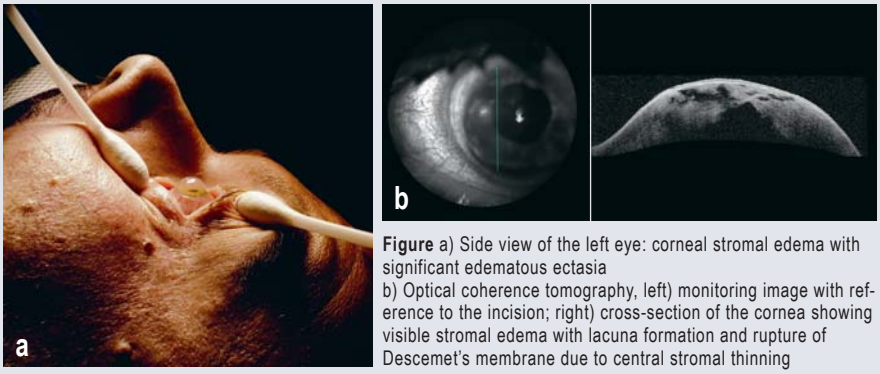

Figure a) Side view of the left eye: corneal stromal edema with significant edematous ectasia
b) Optical coherence tomography, left) monitoring image with reference to the incision; right) cross-section of the cornea showing visible stromal edema with lacuna formation and rupture of Descemet's membrane due to central stromal thinning

A 40-year-old man experienced painful acute loss of vision in the left eye. Ophthalmological examination revealed the "acute form" of keratoconus *(Figure a)*. Keratoconus is a non-inflammatory, often progressive, irregular bulging and thinning of the cornea. A complication of the disorder results in acute corneal hydrops, in which the severely thinned and stretched Descemet's membrane tears, causing aqueous humor leakage and massive corneal stromal edema *(Figure b)*. Keratoconus usually becomes symptomatic in puberty and stabilizes by the age of 30–40 years. Incidence rates are 1.5–25 cases per 100 000 persons/year. Possible sequelae include: irregular astigmatism, myopia, diminished visual acuity, and in around 3%, acute corneal hydrops. Risk factors include neurodermatitis and excessive eye-rubbing. According to the stage, treatment involves, for example, the use of rigid contact lenses, corneal cross-linking, or at advanced stages, corneal transplantation (perforating keratoplasty). Our patient was successfully treated with deep-stromal adapting sutures in the cornea and excimer laser-assisted perforating keratoplasty. The patient's vision recovered to uncorrected 0.16 on the fifth postoperative day.

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Questions on this article

Participation is possible at cme.aerzteblatt.de. The submission deadline is 6 March 2026.

Only one answer is possible per question. Please select the answer that is most appropriate.

Question 1

What percentage of patients presenting to the emergency room have acute abdominal pain?

a) 1–2%
b) 3–4%
c) 5–12%
d) 18–25%
e) 33–40%

Question 2

Which of the following best characterizes guarding/ peritoneal signs?

a) rebound pain
b) cramp-like pain
c) easily localizable pain
d) pain triggered by even the slightest vibration
e) pain only on deep palpation

Question 3

What imaging method for patients with an acute abdomen has the highest sensitivity and specificity?

a) magnetic resonance imaging
b) contrast-enhanced CT
c) positron emission tomography
d) plain films
e) colonoscopy

Question 4

What is the most common cause of an acute abdomen?

a) cholecystitis
b) pancreatitis
c) sigmoid diverticulitis
d) appendicitis
e) mesenteric ischemia

Question 5

Which of the following is a true statement about imaging in pregnant women or nursing mothers with an acute abdomen?

a) Magnetic resonance imaging with contrast can be performed in a pregnant woman at any time.
b) When magnetic resonance imaging is performed in pregnant women, contrast medium should be given only in exceptional cases when absolutely necessary.
c) Non-contrast magnetic resonance imaging in pregnant women is uninformative, and this is why plain films are the imaging study of choice.
d) Computerized tomography carries no risk for the fetus.
e) Magnetic resonance imaging with contrast medium is contraindicated for nursing mothers.

Question 6

How much time should elapse between the arrival of a patient with an acute abdomen in the emergency room and his or her initial contact with a nurse?

a) no more than 10 minutes
b) no more than 60 minutes
c) no more than 2 hours
d) no more than 4 hours
e) no more than 6 hours

Question 7

Which of the following is *not* a relative contraindication for diagnostic laparoscopy?

a) diaphragmatic rupture
b) hemodynamic instability
c) manifest coagulation disturbance
d) acute cholecystitis
e) multiple previous abdominal operations

Question 8

What is the typical quality of visceral pain in a patient with an acute abdomen?

a) sharp and burning
b) dull, deep, and diffuse
c) superficial and stabbing
d) short and intermittent
e) localized and constant

Question 9

Which of the following is a true statement about the care of patients with an acute abdomen in the emergency room?

a) A patient with the clinical picture of an acute abdomen must always be given a high-priority initial assessment (ESI 1 or 2).
b) For a patient with the clinical picture of an acute abdomen, initial contact with a nurse within 60 minutes of arrival is sufficient.
c) Every patient with an acute abdomen must be treated surgically without delay.
d) The acute abdomen is diagnosed by a blood test.
e) Interdisciplinary consultations should be obtained only after completion of the diagnostic work-up

Question 10

Which statement about abdominal ultrasonography is true?

a) It is a widely available, rapid imaging method for the detection and classification of many types of pathology.
b) It is more sensitive than CT.
c) It is superior to magnetic resonance imaging, particularly for the diagnosis of injuries to the solid organs of the upper abdomen.
d) It is no longer of any value.
e) It has the highest sensitivity and specificity of all imaging methods.

Participation is possible only via the Internet: cme.aerzteblatt.de

Supplementary material to accompany the article

The Acute Abdomen

Structured Diagnosis and Treatment

by Nikolaus Börner, Alina-Sophie Kappenberger, Sabine Weber, Florian Scholz, Philipp Kazmierczak, and Jens Werner

Dtsch Arztebl Int 2025; 122: 137-44. DOI: 10.3238/arztebl.m2025.0019

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eCASE ILLUSTRATIONS

Acute mesenteric ischemia

Acute mesenteric ischemia is a life-threatening condition whose outcome depends largely on prompt diagnosis and treatment. The incidence of acute mesenteric ischemia is from 6.2 to 8.7 cases per 100 000 persons per year. It becomes more common with age: beyond age 85, its incidence is up to 190 cases per 100 000 persons per year. The mortality associated with this condition depends on its cause and remains high in general despite the currently established methods of diagnostic evaluation and treatment. In patients with mesenteric arterial occlusion due to embolism or thrombosis, mortality can be as high as 60%. Acute mesenteric ischemia due to venous thrombosis is fatal in approximately 25% of cases. Non-occlusive mesenteric ischemia (NOMI) is especially critical, with a mortality above 60%. Its outcome depends crucially on the time to the initiation of treatment: if the treatment is delayed, the mortality can rise to over 90% within just 12 hours (e35). These figures underscore the need for diagnostic evaluation and treatment to be provided as rapidly as possible to all patients with suspected acute mesenteric ischemia, and especially to those at elevated risk, such as the elderly and those with pre-existing cardiovascular disease (e36). The correct diagnosis of acute mesenteric ischemia is a challenge because the symptoms are often nonspecific and easy to misinterpret. A typical feature is the lack of marked clinical findings on initial presentation despite the patient's complaint of severe pain. Several hours often elapse between the onset of symptoms and the definitive diagnosis and initiation of treatment (e37). The initial acute and cramping abdominal pain is often followed, 3–6 hours later, by a deceptively pain-free interval. This is due to the loss of intramural pain receptors because of persistent ischemia. After 6 hours, the mucosal barrier undergoes infarction and the intestinal wall becomes necrotic. The disintegration of the mucosal barrier leads to bacterial translocation, transmigration peritonitis, ileus, sepsis, and multiple organ failure. There are no specific laboratory tests for ischemic or necrotic bowel, but the condition is accompanied by a rise in lactate, leukocytes, and D-dimers (e38–e40) *(eBox 1)*.

Case Illustration 1

A 55-year-old man was admitted to the shock room with an acute abdomen (ESI 1). He reported having had diarrhea for 24 hours and an acute onset of pain approximately 10 hours before presentation.

Initial clinical state

Acute abdomen with septic shock (catecholamine requirement in the emergency department). Time course: arrival in hospital at 19:50, CT at 20:02, initiation of surgical measures at 21:05.

Diagnostic evaluation

Abdominal CT revealed occlusive mesenteric ischemia. As seen in *eFigure 1,* CT with arterial contrast medium and sagittal reconstruction showed a) an acute thrombotic occlusion of the mesenteric artery in its middle third, with b) consequent intestinal necrosis that is visible as a lack of contrast enhancement of the affected portion of the intestinal wall.

Laboratory values

Lactate 3.5 mmol/L, CRP 37.5 mg/dL, procalcitonin 47.9 ng/mL, leukocytes 20.4 G/L, interleukin-6 1821 pg/mL.

Emergency surgical treatment

At the initial emergency laparotomy, an embolus was found in the superior mesenteric artery and was removed by open embolectomy. Because only 40 cm of small bowel would have been maintained, no resection was initially performed and a second look was scheduled for the following day *(eFigure 1c)*.

At the second-look procedure 12 hours later, 200 cm of small bowel were removed. About 100 cm of small bowel were preserved, the ends were blindly closed, and a reevaluation was planned for 24 hours later. At the third-look procedure, 36 hours after the first, an anastomotic stoma was created [terminal ileum (approx. 40 cm) and jejunum (approx. 60 cm) *(eFigure 1)*.

eBox

Because of the high mortality of acute mesenteric ischemia, the international guidelines contain the following recommendations: (40)

- Severe abdominal pain with only mild or no abnormal physical findings should be considered to reflect acute mesenteric ischemia (AMI) until this is ruled out.
- Computed tomographic angiography (CTA) should be performed without delay in every patient with suspected acute mesenteric ischemia (AMI).
- If AMI is diagnosed, fluid resuscitation should be initiated immediately to improve organ perfusion. Electrolyte disturbances should be rapidly corrected, and a nasogastric tube should be placed.
- Broad-spectrum antibiotics are indicated.
- Measures to restore blood supply to the ischemic bowel, as well as the resection of all necrotic or ischemic bowel segments, should be undertaken immediately.

Further course

The patient subsequently underwent prolonged treatment on the intensive care unit with catecholamines for septic circulatory failure. No further surgery was needed. He made a good recovery, and intestinal continuity was restored 10 months later. He how has a mild short bowel syndrome and has been regularly attending the outpatient clinic for short bowel syndrome for the past three years. His condition is well managed with medication, and he can maintain his body weight.

Interdisciplinary care

The acute abdomen is primarily a surgical condition. Some situations, however, are not classifiable as purely surgical or purely medical and require interdisciplinary care (surgery, internal medicine, interventional radiology). One such situation is sigmoid diverticulitis, as discussed in the next Case Illustration.

Covered or perforated sigmoid diverticulitis

Perforation of the gastrointestinal tract is less common than acute inflammatory diseases such as appendicitis or cholecystitis, but it is still an important differential diagnosis of the acute abdomen (26, e41). Acute diverticulitis (types I–III in the Classification of Diverticular Disease [CDD]) is very common; it has a wide range of severity, and diverse complications (e42). Depending on the stage, acute diverticulitis may require either conservative treatment (antibiotics) or emergency surgery. Patients with freely perforated diverticulitis (Type 3) usually present with an acute abdomen and need immediate surgery. Those with acute diverticulitis of type 1 or type 2a (diverticulitis with microabscesses) should be treated conservatively; patients with CDD type 2a diverticulitis should be hospitalized for intravenous antibiotic therapy (piperacillin/tazobactam or ciprofloxacin/metronidazole). Patients with type 2b diverticulitis who have larger retroperitoneal or paracolic abscesses (>3 cm) usually present with more severe symptoms. They are initially treated by interventional drainage (at least), followed by early elective resection after infection control (e42).

Case Illustration 2

A 42-year-old man was transported to the emergency room by ambulance because of a subacute abdomen (ESI 2).

Initial presentation

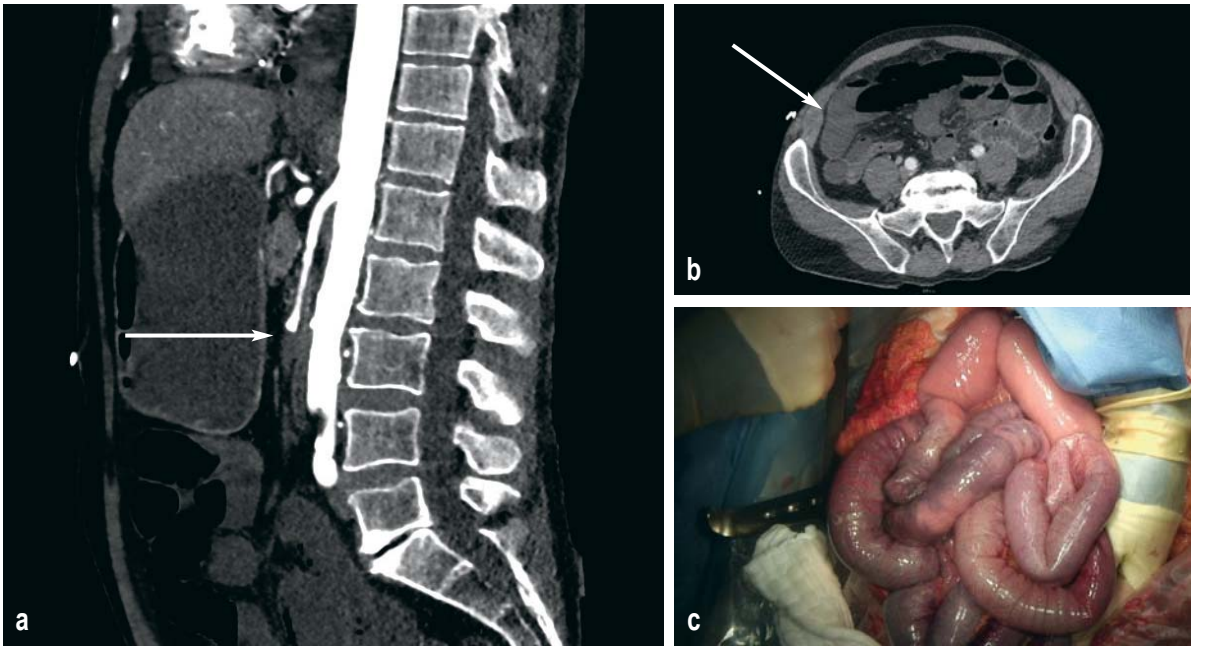
The patient was in a markedly reduced state of health, afebrile and with normal vital signs (no evidence of sepsis), but with a distended abdomen. Peritoneal signs were present in the left lower quadrant and he was classified as having a subacute abdomen.

Diagnostic evaluation

Ultrasonography was performed first and led to the suspicion of sigmoid diverticulitis *(eFigure 2)*. CT then revealed perforated sigmoid diverticulitis with a macroabscess about 7 cm in diameter (solid arrows in Figures a and b), with air-fluid levels within the abscess (dashed arrow in Figure b).

Laboratory values

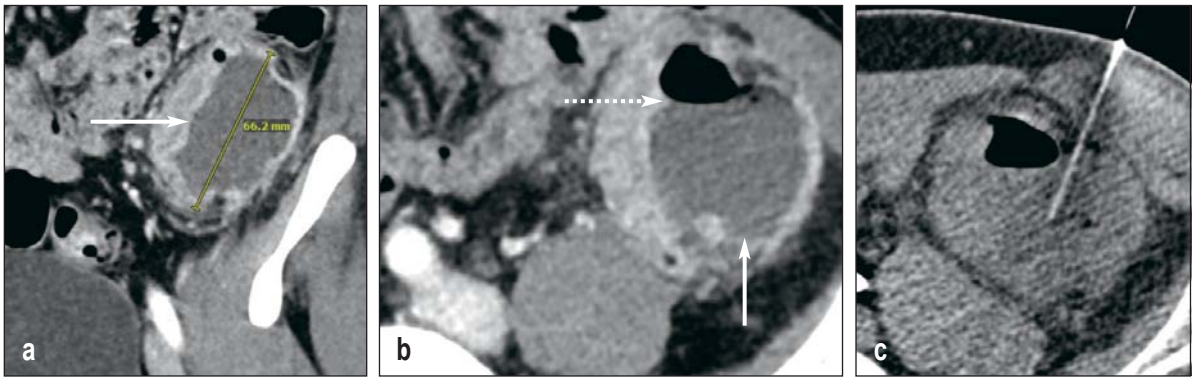
CRP 17.7 mg/dL, leukocytes 17.0 G/L.



eFigure 1: Occlusive mesenteric ischemia
a) Acute thrombotic occlusion of the mesenteric artery in the middle third.
b) Bowel necrosis due to arterial occlusion, visible on CT as a lack of contrast enhancement in the affected portion of the bowel wall.
c) Findings on surgical exploration.

Interdisciplinary emergency treatment

A drain was inserted into the abscess with the Seldinger technique under CT guidance *(eFigure 2c),* and antibiotic treatment was initiated. An elective laparoscopic sigmoidectomy with primary anastomosis was performed seven days later.



eFigure 2: The management of covered perforated sigmoid diverticulitis with macroabscess (Classification of Diverticular Disease 2b)
a) contrast-enhanced CT, coronal
b) contrast-enhanced CT, axial
c) CT fluoroscopy, axial (CT-guided drain placement with the Seldinger technique)